

WHAT IS CLAIMED IS:

1. A labeling reagent for labeling a target, said labeling reagent comprising a marker moiety M and a reactive group R



wherein said marker moiety M and said reactive group R are covalently linked together, said M comprising at least one moiety that comprises a ligand, a dye, or both a ligand and a dye; and said reactive group R being capable of forming a carbon-carbon linkage with said target.

2. The labeling reagent of claim 1, wherein said target comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a ligand, an antigen, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

3. The labeling reagent of claim 2, wherein said nucleic acid or nucleotide or nucleotide analog is modified.

4. The labeling reagent of claim 1, wherein said ligand comprises biotin, iminobiotin, digoxigenin or fluorescein.

5. The labeling reagent of claim 1, wherein said dye comprises a fluorescent dye.

6. The labeling reagent of claim 5, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

7. The labeling reagent of claim 6, wherein said xanthene dye comprises fluorescein, rhodamine or rhodol, or derivatives thereof.

8. The labeling reagent of claim 1, further comprising a linker arm between said marker moiety M and said reactive group R.
9. The labeling reagent of claim 8, wherein said linker arm is flexible, semi-rigid or rigid.
10. The labeling reagent of claim 8, wherein said linker arm has a backbone comprising one or more carbon atoms.
11. The labeling reagent of claim 8, wherein said linker arm has a backbone comprising at least one non-carbon atom.
12. The labeling reagent of claim 11, wherein said non-carbon atom comprises sulfur, oxygen or nitrogen.
13. The labeling reagent of claim 10, wherein said backbone comprises one or more peptide bonds.
14. The labeling reagent of claim 1, wherein said reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.
15. The labeling reagent of claim 14, wherein said metallo-organic compound comprises mercury, zinc, copper or platinum.
16. The labeling reagent of claim 14, wherein said metallo-organic compound comprises an aromatic group, an aromatic heterocyclic group, an alkene group or an alkyne group.

17. A process for labeling a target, said process comprising the steps of:

(a) providing:

(i) said target;

(ii) a labeling reagent comprising a marker moiety M and a reactive group R



wherein said marker moiety M and said reactive group R are covalently linked together, said M comprising at least one moiety that comprises a ligand, a dye, or both a ligand and a dye; and said reactive group R being capable of forming a carbon-carbon linkage with said target; and

(b) reacting said target (i) and said labeling reagent (ii) under conditions such that a carbon-carbon linkage forms between said target (i) and said labeling reagent (ii), thereby labeling said target (i) with said marker moiety M.

18. The process of claim 17, wherein in said providing step, the target comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a ligand, an antigen, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

19. The process of claim 17, wherein in said providing step, the ligand comprises biotin, iminobiotin, digoxigenin or fluorescein, and the dye comprises a fluorescent dye.

20. The process of claim 19, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

21. The process of claim 17, wherein said providing or reacting step, the reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

22. The process of claim 17, wherein in said providing step, the target has been modified.

23. The process of claim 22, wherein said modified target comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

24. A labeled target, said target having been labeled by a process comprising the steps of:

(a) providing:

(i) said target;

(ii) a labeling reagent comprising a marker moiety M and a reactive group R



wherein said marker moiety M and said reactive group R are covalently linked together, said M comprising at least one moiety that comprises a ligand, a dye, or both a ligand and a dye; and said reactive group R being capable of forming a carbon-carbon linkage with said target;

(b) reacting said target (i) and said labeling reagent (ii) under conditions such that a carbon-carbon linkage forms between said target (i) and said labeling reagent (ii), thereby labeling said target (i) with said marker moiety M.

25. The process of claim 24, wherein in said providing step, the target comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a ligand, an antigen, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

26. The process of claim 24, wherein in said providing step, the ligand comprises biotin, iminobiotin, digoxigenin or fluorescein, and the dye comprises a fluorescent dye.

27. The process of claim 26, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

28. The process of claim 24, wherein said providing or reacting step, the reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

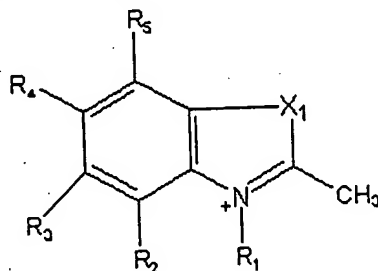
29. The process of claim 24, wherein in said providing step, the target has been modified.

30. The process of claim 29, wherein said modified target comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

31. A process for preparing a cyanine dye labeling reagent, said process comprising the steps of:

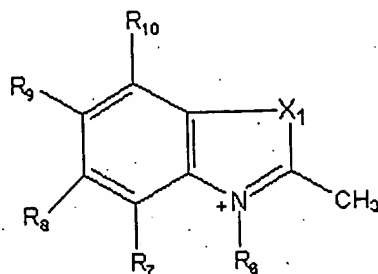
(a) providing:

(i) a first intermediate compound comprising:



wherein X₁ comprises carbon, oxygen, nitrogen or sulfur; and

(ii) a second intermediate compound comprising:

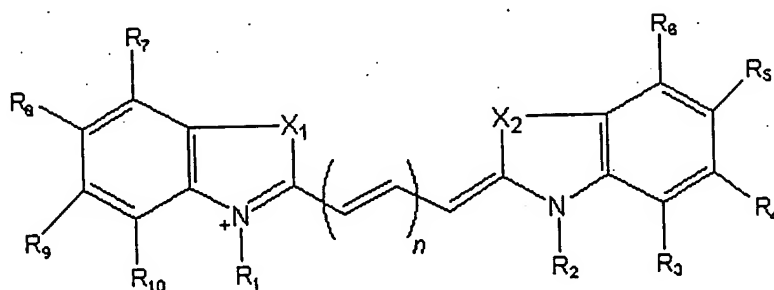


wherein X₁ comprises carbon, oxygen, nitrogen or sulfur;

wherein at least one of R₁ through R₁₀ comprises a reactive group capable of forming a carbon-carbon linkage with a target, and

(ii) linking reagents suitable for linking said first intermediate compound and said second intermediate compound;

(b) forming a reaction mixture comprising said first intermediate compound (i), said second intermediate compound (ii), and said linking reagents under conditions to link (i) and (ii) to form



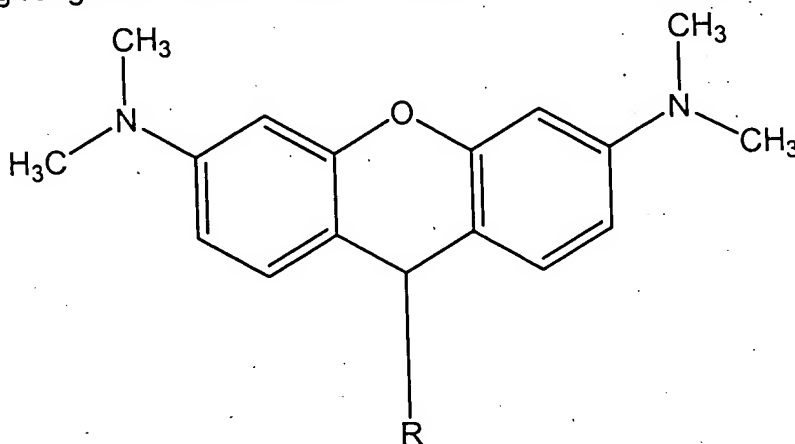
wherein at least one of R₁ through R₁₀ comprises a reactive group capable of forming a carbon-carbon linkage with a target, and wherein *n* is an integer of 1, 2 or 3, and wherein X₁ and X₂ independently comprise carbon, oxygen, nitrogen or sulfur.

32. The process of claim 31, wherein said providing step, the reactive group comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

33. The process of claim 31, wherein R1 through R10 independently comprise hydrogen, C₁-C₆ alkyl, a C₀-C₄ alkyl group having a hydrophilic substituent comprising sulfonate, carboxylate, hydroxyl, substituted amines and quaternary amines, aliphatic, alkenes, alkynes, charged or polar groups, or combinations of any of the foregoing.

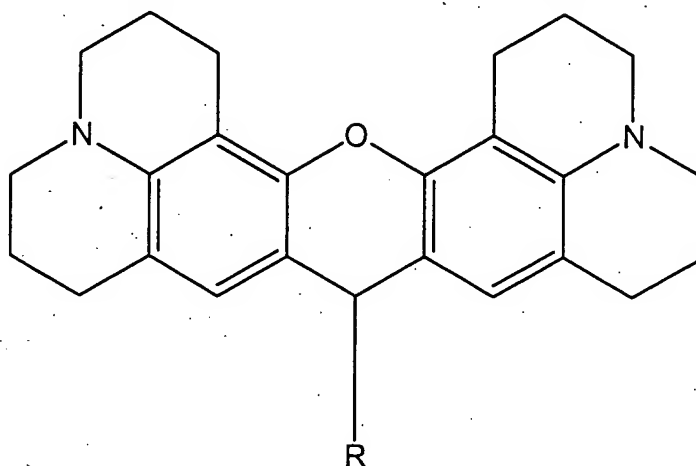
34. A labeling reagent comprising an aphenylic analog of a rhodamine dye, said analog comprising at least one reactive group for attaching said labeling reagent to a target, said at least one reactive group being attached directly to said analog or indirectly through a linker arm.

35. The labeling reagent of claim 34, said reagent having the structure



wherein R is a reactive group for attaching said labeling reagent to a target, and
wherein R is attached directly or indirectly through an aphenylic linker arm.

36. The labeling reagent of claim 34, said reagent having the structure



wherein R is a reactive group for attaching said labeling reagent to a target, and wherein R is attached directly or indirectly through an aphenylic linker arm.

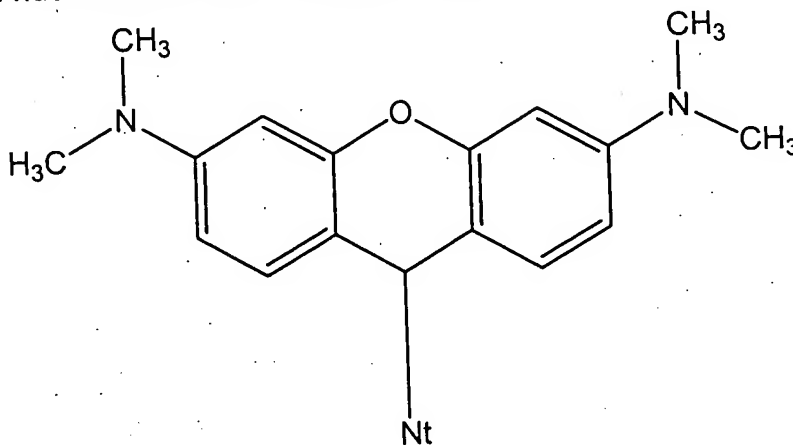
37. The labeling reagent of claim 34, 35 or 36, wherein said reactive group comprises sulfhydryl, hydroxyl, amine, isothiocyanate, isocyanate, monochlorotriazine, dichlorotriazine, mono- or di-halogen substituted pyridine, mono- or di-halogen substituted diazine, maleimide, aziridine, sulfonylhalide, acid halide, hydroxysuccinimide ester, hydroxysulfosuccinimide ester, imidoester, hydrazine, azidonitrophenyl, azide, 3-(2-pyridyl dithio)-propionamide, glyoxal or aldehyde.

38. The labeling reagent of claim 34, 35 or 36, wherein said reactive group is capable of forming a carbon-carbon linkage with a target.

39. The labeling reagent of claim 38, wherein said reactive group comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

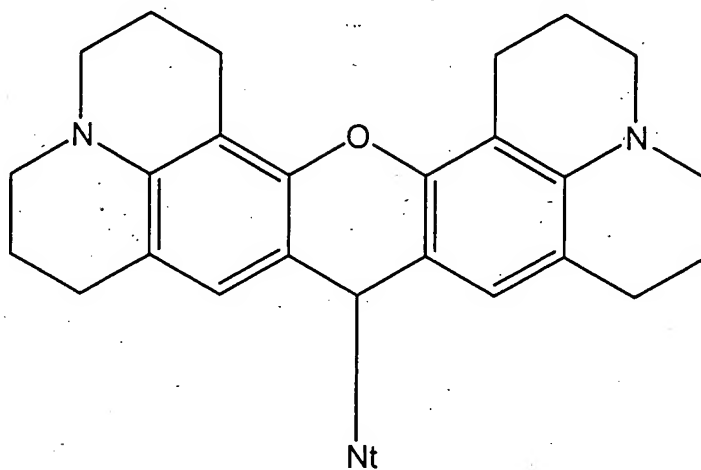
40. The labeling reagent of claim 39, wherein said metallo-organic compound comprises mercury, zinc, copper or platinum.

41. The labeling reagent of claim 39, wherein said metallo-organic compound comprises an alkene group or an alkyne group.
42. The labeling reagent of claim 34, wherein said aphenylic linker arm has a backbone comprising one or more carbon atoms.
43. The labeling reagent of claim 34, wherein said aphenylic linker arm has a backbone comprising at least one non-carbon atom.
44. A labeled nucleotide comprising an aphenylic analog of a rhodamine dye, wherein said dye is attached directly to said nucleotide or indirectly through a linker.
45. The labeled nucleotide of claim 44, said labeled nucleotide having the structure:



wherein Nt comprises a nucleotide.

46. The labeled nucleotide of claim 44, said labeled nucleotide having the structure:



wherein Nt comprises a nucleotide.

47. The labeled nucleotide of claims 44, 45 or 46, wherein said nucleotide comprises a mono-phosphate, a di-phosphate or a tri-phosphate.

48. The labeled nucleotide of claims 44, 45 or 46, wherein said linker arm has a backbone comprising one or more carbon atoms.

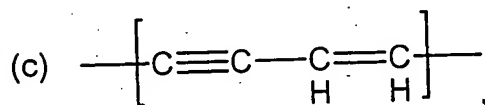
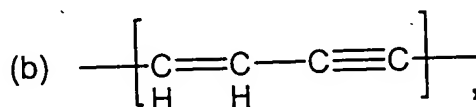
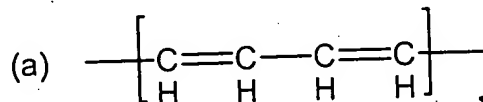
49. The labeled nucleotide of claims 44, 45 or 46, wherein said linker arm has a backbone comprising at least one non-carbon atom.

50. The labeled nucleotide of claims 44, 45 or 46, wherein said linker arm comprises two or more consecutive peptide bonds.

51. A labeled target comprising



wherein T is a target, M is a marker moiety and L is a chemical group covalently linking said M to T, said chemical group L comprising a backbone that comprises at least one rigid group that comprises one or more of:



(d) multimers of (a), (b) or (c),

and (e) any combinations of (a), (b), (c) and (d).

52. The labeled target of claim 51, wherein said target T comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a ligand, an antigen, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

53. The labeled target of claim 52, wherein said nucleic acid or nucleotide or nucleotide analog is modified.

54. The labeled target of claim 52, wherein said ligand comprises biotin, iminobiotin, digoxigenin or fluorescein.

55. The labeled target of claim 51, wherein said marker moiety M comprises a ligand that comprises biotin, iminobiotin, digoxigenin or fluorescein.
56. The labeled target of claim 51, wherein said marker moiety M comprises a fluorescent dye.
57. The labeled target of claim 56, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.
58. The labeled target of claim 57, wherein said xanthene dye comprises fluorescein, rhodamine or rhodol, or derivatives thereof.
59. The labeled target of claim 51, wherein said backbone comprises one or more carbon atoms.
60. The labeled target of claim 51, wherein said backbone comprises at least one non-carbon atom.
61. The labeled target of claim 60, wherein said non-carbon atom comprises sulfur, oxygen or nitrogen.
62. The labeled target of claim 51, wherein said chemical group L further comprises at least one additional moiety comprising peptide bonds, amino acids, aliphatic chains from C₁ through C₂₀, alkene groups, alkyne groups, saturated or unsaturated or partially saturated rings, heterocyclic rings and sugars.
63. The labeled target of claim 51, wherein said structure (a) comprises two alkene groups in *cis* conformation to each other.

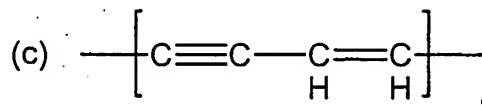
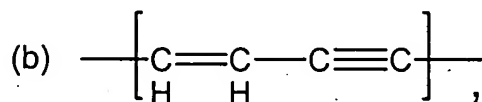
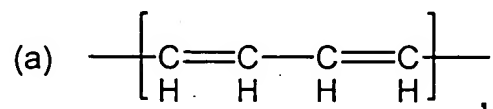
64. The labeled target of claim 51, wherein said structure (a) comprises two alkene groups in *trans* conformation to each other.

65. The labeling reagent of claim 51, wherein one or more hydrogens are substituted by a chemical moiety.

66. A labeling reagent comprising



wherein R is a reactive group, M is a marker moiety and L is a chemical group covalently linking said M to R, said chemical group L comprising a backbone that comprises at least one rigid group that comprises one or more of:



(d) multimers of (a), (b) or (c),

and (e) any combinations of (a), (b), (c) and (d).

67. The labeling reagent of claim 66, wherein said reactive group R comprises sulfhydryl, hydroxyl, amine, isothiocyanate, isocyanate, monochlorotriazine, dichlorotriazine, mono- or di-halogen substituted pyridine, mono- or di-halogen substituted diazine, maleimide, aziridine, sulfonylhalide, acid halide, hydroxysuccinimide ester, hydroxysulfosuccinimide ester, imidoester, hydrazine, azidonitrophenyl, azide, 3-(2-pyridyl dithio)-propionamide, glyoxal or aldehyde.

68. The labeling reagent of claim 67, wherein as a reactive group R is capable of forming a carbon-carbon linkage with a target.

69. The labeling reagent of claim 68, wherein said reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

70. The labeling reagent of claim 69, wherein said metallo-organic compound comprises mercury, zinc, copper or platinum.

71. The labeling reagent of claim 69, wherein said metallo-organic compound comprises an aromatic group, an aromatic heterocyclic group, an alkene group or an alkyne group.

72. The labeling reagent of claim 66, wherein said marker moiety M comprises a ligand that comprises biotin, iminobiotin, digoxigenin or fluorescein.

73. The labeling reagent of claim 66, wherein said marker moiety M comprises a fluorescent dye.

74. The labeling reagent of claim 73, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

75. The labeling reagent of claim 74, wherein said xanthene dye comprises fluorescein, rhodamine or rhodol, or derivatives thereof.

76. The labeling reagent of claim 66, wherein said backbone comprises one or more carbon atoms.

77. The labeling reagent of claim 66, wherein said backbone comprises at least one non-carbon atom.

78. The labeling reagent of claim 77, wherein said non-carbon atom comprises sulfur, oxygen or nitrogen.

79. The labeling reagent of claim 77, wherein said chemical group L further comprises at least one additional moiety comprising peptide bonds, amino acids, aliphatic chains from C₁ through C₂₀, alkene groups, alkyne groups, saturated or unsaturated or partially saturated rings, heterocyclic rings and sugars.

80. The labeling reagent of claim 66, wherein said structure (a) comprises two alkene groups in *cis* conformation to each other.

81. The labeling reagent of claim 66, wherein said structure (a) comprises two alkene groups in *trans* conformation to each other.

82. The labeling reagent of claim 66, wherein one or more hydrogens are substituted by a chemical moiety.

83. A labeled target comprising



wherein T is a target, M is a marker moiety and L is a chemical group covalently linking said M to T, said chemical group L comprising a backbone that comprises at least two consecutive polar rigid units.

84. The labeled target of claim 83, wherein said target T comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a ligand, an antigen, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

85. The labeled target of claim 84, wherein said nucleic acid or nucleotide or nucleotide analog is modified.

86. The labeled target of claim 84, wherein said ligand comprises biotin, iminobiotin, digoxigenin or fluorescein.

87. The labeled target of claim 83, wherein said marker moiety M comprises a ligand that comprises biotin, iminobiotin, digoxigenin or fluorescein.

88. The labeled target of claim 83, wherein said marker moiety M comprises a fluorescent dye.

89. The labeled target of claim 88, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

90. The labeled target of claim 89, wherein said xanthene dye comprises fluorescein, rhodamine or rhodol, or derivatives thereof.

91. The labeled target of claim 83, wherein at least one of said two consecutive rigid polar units of said backbone is heteroatomic.

92. The labeled target of claim 91, wherein said heteroatomic backbone comprises a carbon atom that is bonded to a N, S, O, P or halogen atom.

93. The labeled target of claim 91, wherein said heteroatom comprises an -OH, -SH, -SO₃, -PO₄, -COOH or -NH₂ groups.
94. The labeled target of claim 91, wherein at least one of said two consecutive rigid polar units comprises a peptide bond.
95. The labeled target of claim 91, wherein at least one of said two consecutive polar units comprises a ring structure.
96. The labeled target of claim 95, wherein said ring structure further comprises polar or charged functional groups attached to said ring.
97. The labeled target of claim 96, wherein said polar or charged functional groups comprise halide, -OH, -SH, -SO₃, -PO₄, -COOH or -NH₂ groups.
98. The labeled target of claim 95, wherein said ring structure comprises a sugar.
99. The labeled target of claim 95, wherein said ring structure comprises a substituted heterocyclic aromatic compound.
100. The labeled target of claim 83, wherein said backbone comprises one or more carbon atoms.
101. The labeled target of claim 83, wherein said backbone comprises at least one non-carbon atom.
102. The labeled target of claim 101, wherein said non-carbon atom comprises sulfur, oxygen or nitrogen.

103. The labeled target of claim 83, wherein said chemical group L further comprises at least one additional moiety comprising peptide bonds, amino acids, aliphatic chains from C₁ through C₂₀, alkene groups, alkyne groups, saturated or unsaturated or partially saturated rings, heterocyclic rings and sugars.

104. A labeling reagent comprising



wherein R is a reactive group, M is a marker moiety and L is a chemical group covalently linking said M to R, said chemical group L comprising a backbone that comprises at least two consecutive polar rigid units.

105. The labeling reagent of claim 104, wherein said reactive group R comprises sulfhydryl, hydroxyl, amine, isothiocyanate, isocyanate, monochlorotriazine, dichlorotriazine, mono- or di-halogen substituted pyridine, mono- or di-halogen substituted diazine, maleimide, aziridine, sulfonylhalide, acid halide, hydroxysuccinimide ester, hydroxysulfosuccinimide ester, imidoester, hydrazine, azidonitrophenyl, azide, 3-(2-pyridyl dithio)-propionamide, glyoxal or aldehyde.

106. The labeling reagent of claim 104, wherein as a reactive group R is capable of forming a carbon-carbon linkage with a target.

107. The labeling reagent of claim 104, wherein said reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

108. The labeling reagent of claim 107, wherein said metallo-organic compound comprises mercury, zinc, copper or platinum.

109. The labeling reagent of claim 107, wherein said metallo-organic compound comprises an aromatic group, an aromatic heterocyclic group, an alkene group or an alkyne group.

110. The labeling reagent of claim 104, wherein said marker moiety M comprises a ligand that comprises biotin, iminobiotin, digoxigenin or fluorescein.

111. The labeling reagent of claim 104, wherein said marker moiety M comprises a fluorescent dye.

112. The labeling reagent of claim 111, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

113. The labeling reagent of claim 112, wherein said xanthene dye comprises fluorescein, rhodamine or rhodol, or derivatives thereof.

114. The labeled target of claim 104, wherein at least one of said two consecutive rigid polar units is heteroatomic.

115. The labeled target of claim 114, wherein said heteroatomic rigid polar units comprises a carbon atom that is bonded to a N, S, O, P or halogen atom.

116. The labeled target of claim 114, wherein said heteroatom comprises an -OH, -SH, -SO₃, -PO₄, -COOH or -NH₂ groups.

117. The labeled target of claim 104, wherein at least one of said two consecutive rigid polar units comprises a peptide bond.

118. The labeled target of claim 104, wherein at least one of said two consecutive polar units comprises a ring structure.

119. The labeled target of claim 118, wherein said ring structure further comprises polar or charged functional groups attached to said ring.

120. The labeled target of claim 119, wherein said polar or charged functional groups comprise halide, -OH, -SH, -SO₃, -PO₄, -COOH or -NH₂ groups.

121. The labeled target of claim 118, wherein said ring structure comprises a sugar.

122. The labeled target of claim 118, wherein said ring structure comprises a substituted heterocyclic aromatic compound.

123. The labeling reagent of claim 104, wherein said backbone comprises one or more carbon atoms.

124. The labeling reagent of claim 104, wherein said backbone comprises at least one non-carbon atom.

125. The labeling reagent of claim 124, wherein said non-carbon atom comprises sulfur, oxygen or nitrogen.

126. The labeling reagent of claim 104, wherein said chemical group L further comprises at least one additional moiety comprising peptide bonds, amino acids, aliphatic chains from C₁ through C₂₀, alkene groups, alkyne groups, saturated or unsaturated or partially saturated rings, heterocyclic rings and sugars.

127. A labeled target comprising

T -- L -- M

wherein T is a target, M is a marker moiety and L is a chemical group covalently linking said M to T, said chemical group L comprising a backbone that comprises at least two consecutive peptide bonds.

128. The labeled target of claim 242, wherein said target T comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a ligand, an antigen, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

129. The labeled target of claim 128, wherein said nucleic acid or nucleotide or nucleotide analog is modified.

130. The labeled target of claim 128, wherein said ligand comprises biotin, iminobiotin, digoxigenin or fluorescein.

131. The labeled target of claim 127, wherein said marker moiety M comprises a ligand that comprises biotin, iminobiotin, digoxigenin or fluorescein.

132. The labeled target of claim 127, wherein said marker moiety M comprises a fluorescent dye.

133. The labeled target of claim 132, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

134. The labeled target of claim 133, wherein said xanthene dye comprises fluorescein, rhodamine or rhodol, or derivatives thereof.

135. The labeled target of claim 127, wherein at least one of said two consecutive peptide bonds are separated by a single atom.

136. The labeled target of claim 135, wherein said single atom comprises C, N, S, O or P.

137. The labeled target of claim 127, wherein said backbone comprises one or more carbon atoms.

138. The labeled target of claim 127, wherein said backbone comprises at least one non-carbon atom.

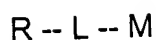
139. The labeled target of claim 138, wherein said non-carbon atom comprises sulfur, oxygen or nitrogen.

140. The labeled target of claim 127, wherein said chemical group L further comprises at least one additional moiety comprising peptide bonds, amino acids, aliphatic chains from C₁ through C₂₀, alkene groups, alkyne groups, saturated or unsaturated or partially saturated rings, heterocyclic rings and sugars.

141. The labeled target of claim 127, wherein said chemical group L comprises a di-peptide or an oligo-peptide.

142. The labeled target of claim 141, wherein said di-peptide or oligo-peptide comprises (glycine)₂ or (glycine)₄.

143. A labeling reagent comprising



wherein R is a reactive group, M is a marker moiety and L is a chemical group covalently linking said M to R, said chemical group L comprising a backbone that comprises at least two consecutive peptide bonds.

144. The labeling reagent of claim 143, wherein said reactive group R comprises sulfhydryl, hydroxyl, amine, isothiocyanate, isocyanate, monochlorotriazine, dichlorotriazine, mono- or di-halogen substituted pyridine, mono- or di-halogen substituted diazine, maleimide, aziridine, sulfonylhalide, acid halide, hydroxysuccinimide ester, hydroxysulfosuccinimide ester, imidoester, hydrazine, azidonitrophenyl, azide, 3-(2-pyridyl dithio)-propionamide, glyoxal or aldehyde.

145. The labeling reagent of claim 143, wherein as a reactive group R is capable of forming a carbon-carbon linkage with a target.

146. The labeling reagent of claim 143, wherein said reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

147. The labeling reagent of claim 146, wherein said metallo-organic compound comprises mercury, zinc, copper or platinum.

148. The labeling reagent of claim 146, wherein said metallo-organic compound comprises an aromatic group, an aromatic heterocyclic group, an alkene group or an alkyne group.

149. The labeling reagent of claim 143, wherein said marker moiety M comprises a ligand that comprises biotin, iminobiotin, digoxigenin or fluorescein.

150. The labeling reagent of claim 143, wherein said marker moiety M comprises a fluorescent dye.

151. The labeling reagent of claim 150, wherein said fluorescent dye comprises a xanthene dye, a cyanine dye, a coumarin dye, a porphyrin dye or a composite dye.

152. The labeling reagent of claim 151, wherein said xanthene dye comprises fluorescein, rhodamine or rhodol, or derivatives thereof.

153. The labeled target of claim 143, wherein at least one of said two consecutive peptide bonds are separated by a single atom.

154. The labeled target of claim 153, wherein said single atom comprises C, N, S, O or P.

155. The labeled target of claim 143, wherein said backbone comprises one or more carbon atoms.

156. The labeled target of claim 143, wherein said backbone comprises at least one non-carbon atom.

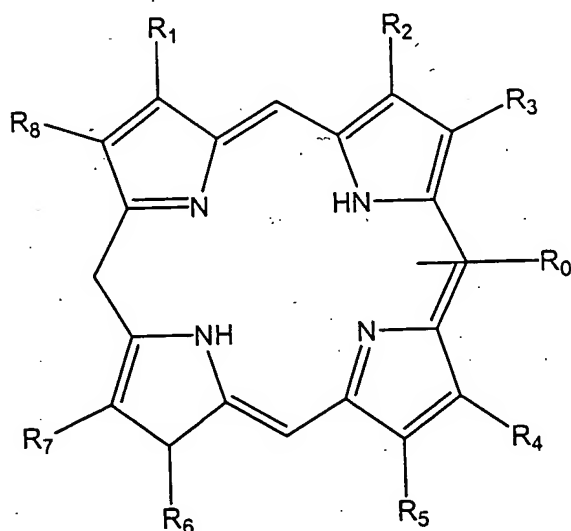
157. The labeled target of claim 143, wherein said non-carbon atom comprises sulfur, oxygen or nitrogen.

158. The labeled target of claim 143, wherein said chemical group L further comprises at least one additional moiety comprising peptide bonds, amino acids, aliphatic chains from C₁ through C₂₀, alkene groups, alkyne groups, saturated or unsaturated or partially saturated rings, heterocyclic rings and sugars.

159. The labeled target of claim 143, wherein said chemical group L comprises a di-peptide or an oligo-peptide.

160. The labeled target of claim 159, wherein said di-peptide or oligo-peptide comprises (glycine)₂ or (glycine)₄.

161. A labeling reagent comprising a nonmetallic porphyrin, said reagent comprising:



wherein R₀ is a reactive group and is attached directly or indirectly to said nonmetallic porphyrin, and R₁ through R₈ independently comprise hydrogen, aliphatic, unsaturated aliphatic, cyclic, heterocyclic, aromatic, heteroaromatic, charged or polar groups, or any combinations of the foregoing.

162. The labeling reagent of claim 161, wherein said reactive group R₀ is attached directly or indirectly to any one of the four non-pyrrole positions.

163. The labeling reagent of claim 161, wherein said reactive group R_0 comprises sulfhydryl, hydroxyl, amine, isothiocyanate, isocyanate, monochlorotriazine, dichlorotriazine, mono- or di-halogen substituted pyridine, mono- or di-halogen substituted diazine, maleimide, aziridine, sulfonylhalide, acid halide, hydroxysuccinimide ester, hydroxysulfosuccinimide ester, imidoester, hydrazine, azidonitrophenyl, azide, 3-(2-pyridyl dithio)-propionamide, glyoxal or aldehyde.

164. The labeling reagent of claim 161, wherein as a reactive group R_0 is capable of forming a carbon-carbon linkage with a target.

165. The labeling reagent of claim 161, wherein said reactive group R_0 comprises an alkene group, an alkyne group or a halogenated compound.

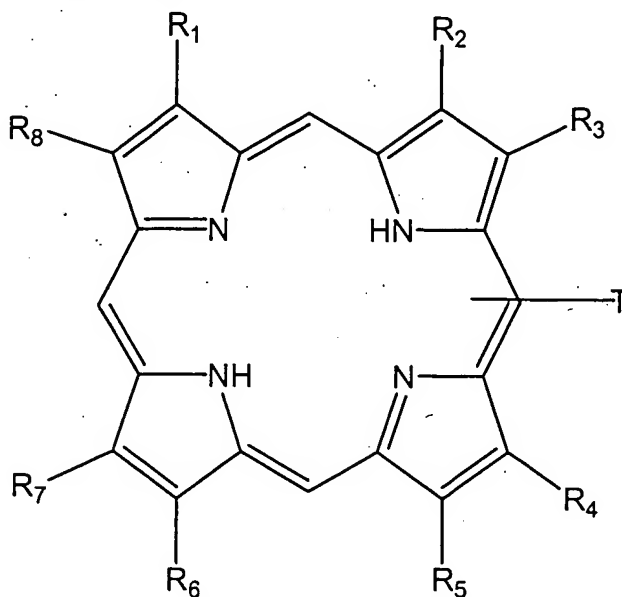
166. The labeling reagent of claim 161, wherein any of said R_1 through R_8 alkyl groups comprises methyl, ethyl or propyl.

167. The labeling reagent of claim 161, wherein any of said R_1 through R_8 alkyl groups further comprises a polar or charged group.

168. The labeling reagent of claim 161, wherein said reactive group R_0 is attached indirectly to said nonmetallic porphyrin through a linker arm.

169. The labeling reagent of claim 168, wherein said linker arm comprises at least two consecutive peptide bonds.

170. A labeled target comprising a nonmetallic porphyrin, said reagent comprising:



wherein T is a target molecule attached directly or indirectly to said nonmetallic porphyrin and R₁ through R₈ independently comprise hydrogen, aliphatic, unsaturated aliphatic, cyclic, heterocyclic, aromatic, heteroaromatic, charged or polar groups, or any combinations of the foregoing.

171. The labeled target of claim 170, wherein said reactive group R₀ is attached directly or indirectly to any one of the four non-pyrrole positions.

172. The labeled target of claim 170, wherein said target T comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

173. The labeled target of claim 172, wherein said nucleic acid or nucleotide or nucleotide analog is modified.

174. The labeling reagent of claim 170, wherein any of said R_1 through R_8 alkyl groups comprises methyl, ethyl or propyl.

175. The labeling reagent of claim 170, wherein any of said R_1 through R_8 alkyl groups further comprises a polar or charged group.

176. The labeling reagent of claim 170, wherein said target T is attached indirectly to said nonmetallic porphyrin through a linker arm.

177. The labeling reagent of claim 176, wherein said linker arm comprises at least two consecutive peptide bonds.

178. A process for determining the amount of a nucleic acid in a sample of interest, said process comprising the steps of:

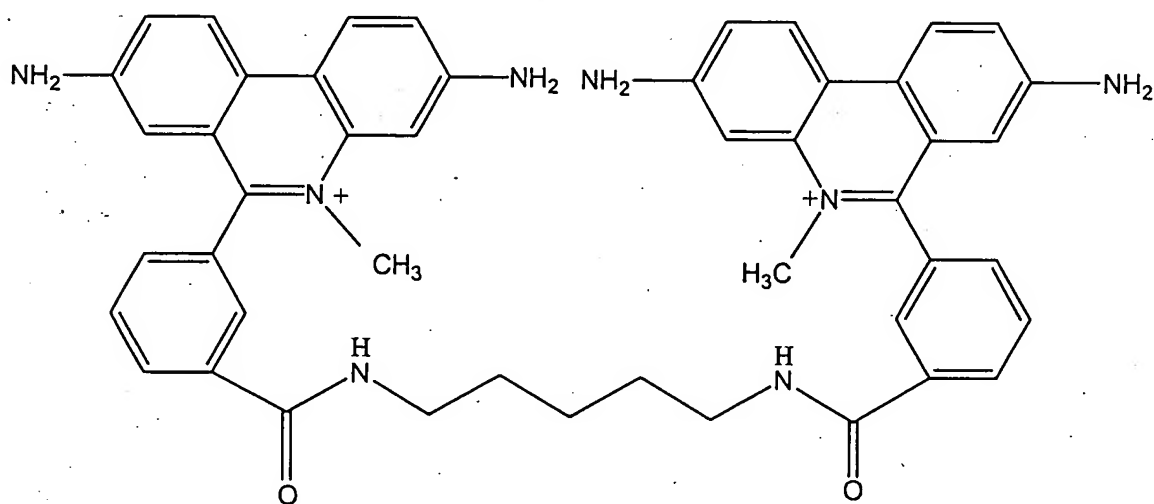
- (a) providing:
 - (i) said sample of interest;
 - (ii) a dye comprising a first phenanthridinium moiety linked to a second phenanthridinium moiety through a phenyl group in each of said first and second phenanthridinium moieties;
 - (iii) reagents for carrying out dye binding, hybridization, strand extension, or any combination thereof;
- (b) forming a mixture of (i), (ii) and (iii) above, to produce a complex comprising said dye (ii) and any nucleic acid that may be present in said sample of interest (i);
- (c) illuminating said mixture formed in step (b) at a wavelength below 400 nanometers (nm); and
- (d) measuring fluorescent emission from said illuminated mixture in step (c), said emission being proportional to the quantity of any nucleic acid present in said sample of interest (i).

179. The process of claim 178, wherein said sample of interest (i) is suspected of containing a nucleic acid or nucleic acids of interest.

180. The process of claim 179, wherein said nucleic acid or nucleic acids are double-stranded, single-stranded or a mixture of double-stranded and single-stranded nucleic acids

181. The process of claim 179, wherein said nucleic acid or nucleic acids comprise DNA, RNA or a mixture of RNA and DNA.

182. The process of claim 178, wherein said dye (ii) has the structure



183. The process of claim 179, further comprising the step (b') of hybridizing said nucleic acid or nucleic acids of interest to complementary nucleic acid strands or sequences fixed or immobilized to a solid support.

184. The process of 183, wherein said solid support comprises beads, tubes, microtiter plates, glass slides, plastic slides, microchip arrays, well or depressions.

185. The process of claim 178, wherein said illuminating step (c) is carried out at 350 nanometers (nm).

186. The process of claim 178, wherein said measuring step (d) is carried out at greater than 550 nanometers (nm).

187. The process of claim 186, wherein said measuring step (d) is carried out at 600 nanometers (nm).

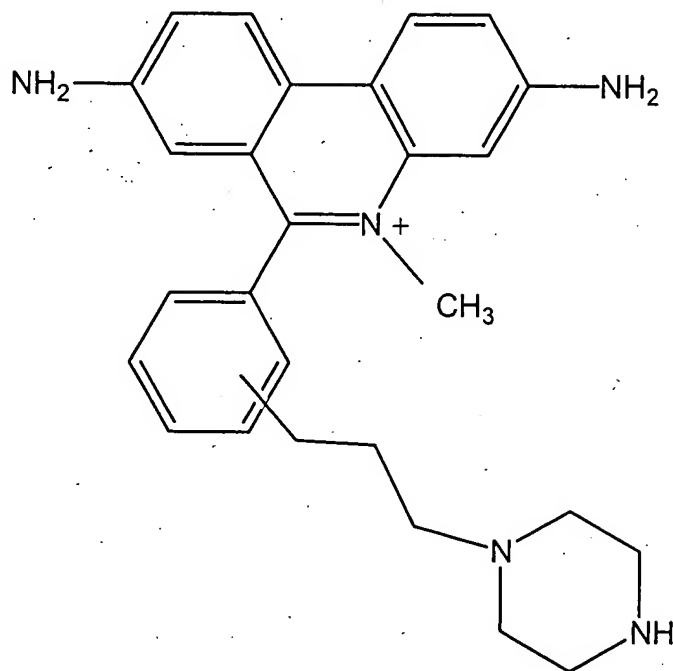
188. The process of claim 178, wherein said measuring step (d) is carried out after or during a primer binding step, a primer extension step, a denaturation step or a step that is added for the purpose of fluorescence measurement.

189. The process of claim 178, wherein said any of said process steps are carried out in a closed container.

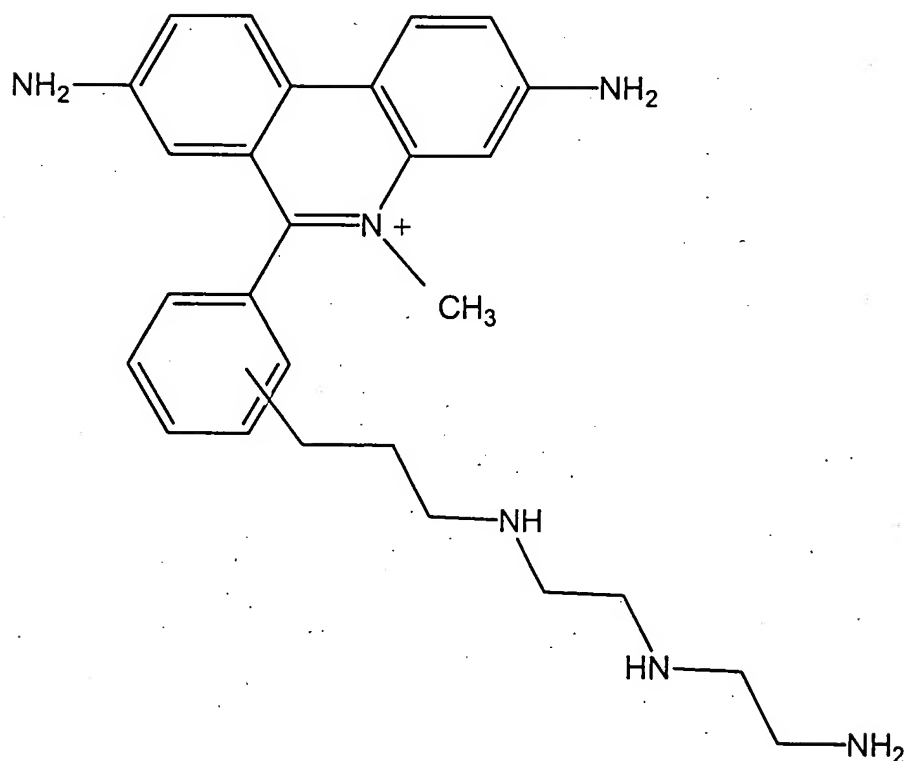
190. The process of claim 189, wherein said closed container system comprises an illumination source and a detection device or unit.

191. A composition comprising at least one of the following dye structures:

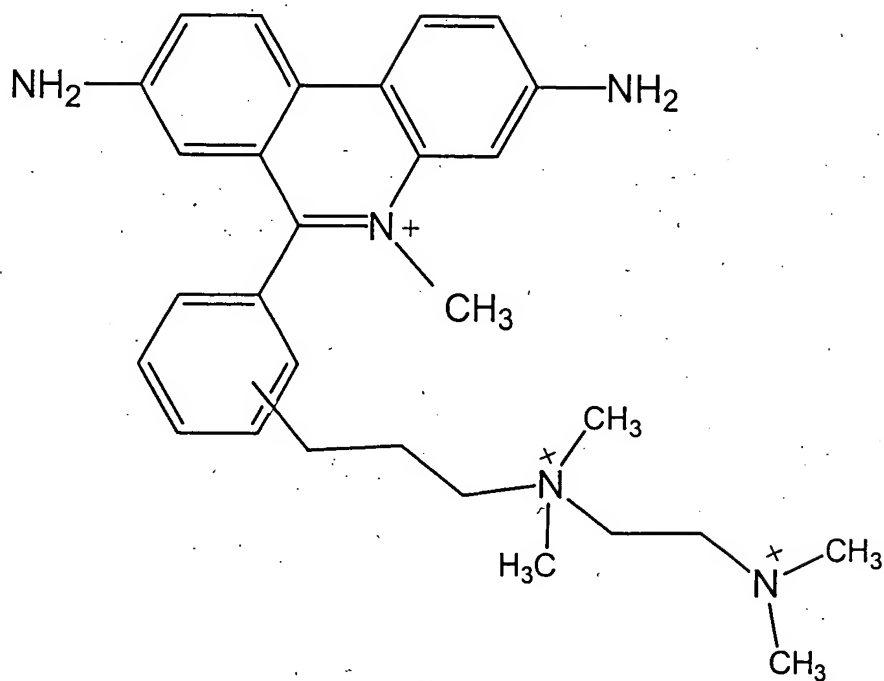
(a)



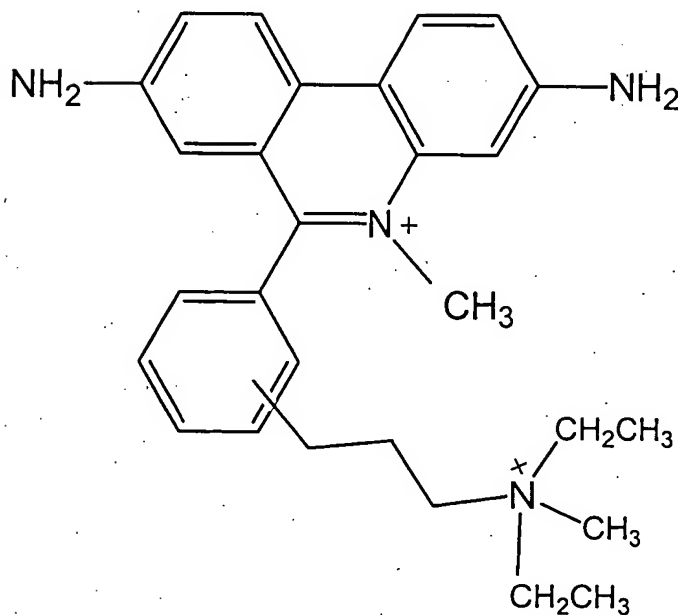
(b)



(c)



and (d)



192. The composition of claim 191, wherein the phenyl ring has been substituted in the *ortho*, *para* or *meta* positions.

193. The composition of claim 192, wherein said substitution is in the *meta* position of the phenyl ring.

194. A process for determining the amount of a nucleic acid in a sample of interest, said process comprising the steps of:

- (a) providing:
 - (i) said sample of interest;
 - (ii) the dye (a), (b), (c) or (d) from the composition of claim 191;
 - (iii) reagents for carrying out dye binding, hybridization, strand extension, or any combination thereof;
- (b) forming a mixture of (i), (ii) and (iii) above, to produce a complex comprising said dye (ii) and any nucleic acid that may be present in said sample of interest (i);
- (c) illuminating said mixture formed in step (b) at a first wavelength; and
- (d) measuring at a second wavelength any fluorescent emission from said illuminated mixture in step (c), said emission being proportional to the quantity of any nucleic acid present in said sample of interest (i).

195. The process of claim 194, wherein said sample of interest (i) is suspected of containing a nucleic acid or nucleic acids of interest.

196. The process of claim 195, wherein said nucleic acid or nucleic acids are double-stranded, single-stranded or a mixture of double-stranded and single-stranded nucleic acids

197. The process of claim 195, wherein said nucleic acid or nucleic acids comprise DNA, RNA or a mixture of RNA and DNA.

198. The process of claim 195, further comprising the step (b') of hybridizing said nucleic acid or nucleic acids of interest to complementary nucleic acid strands or sequences fixed or immobilized to a solid support.

199. The process of 198, wherein said solid support comprises beads, tubes, microtiter plates, glass slides, plastic slides, microchip arrays, well or depressions.

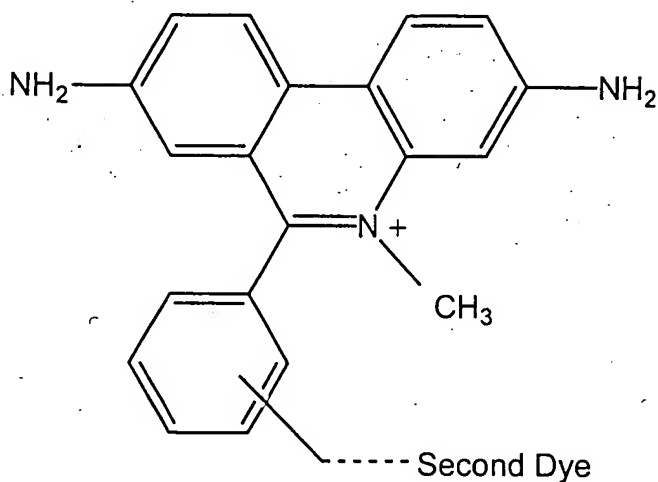
200. The process of claim 194, wherein said measuring step (d) is carried out after or during a primer binding step, a primer extension step, a denaturation step or a step that is added for the purpose of fluorescence measurement

201. The process of claim 194, wherein said any of said process steps are carried out in a closed container.

202. The process of claim 201, wherein said closed container system comprises an illumination source and a detection device or unit.

203. A heterodimeric dye composition, said composition comprising a first dye that comprises a phenanthridinium moiety; and a second dye that is different from said first dye, said second dye being attached through the phenyl ring of said phenanthridinium moiety.

204. The heterodimeric dye composition of claim 203, having the structure



wherein said second dye is not a phenanthridinium moiety.

205. The heterodimeric dye composition of claim 204, wherein said Second Dye is substituted in any of the *ortho*, *meta* or *para* positions of the phenyl ring.

206. The heterodimeric dye composition of claim 205, wherein said Second Dye is substituted in the *meta* position of the phenyl ring.

207. The composition of claims 203 or 204, wherein said second dye comprises a thiazole, a fluorescein, a thiazole-derivative, or a fluorescein derivative.

208. A process for determining the amount of a nucleic acid in a sample of interest, said process comprising the steps of:

(a) providing:

- (i) said sample of interest;
- (ii) the dye of claim 203;
- (iii) reagents for carrying out dye binding, hybridization, strand extension, or any combination thereof;

(b) forming a mixture of (i), (ii) and (iii) above, to produce a complex comprising said dye (ii) and any nucleic acid that may be present in said sample of interest (i);

(c) illuminating said mixture formed in step (b) at a first wavelength; and

(d) measuring at a second wavelength any fluorescent emission from said illuminated mixture in step (c), said emission being proportional to the quantity of any nucleic acid present in said sample of interest (i).

209. The process of claim 208, wherein said sample of interest (i) is suspected of containing a nucleic acid or nucleic acids of interest.

210. The process of claim 209, wherein said nucleic acid or nucleic acids are double-stranded, single-stranded or a mixture of double-stranded and single-stranded nucleic acids.

211. The process of claim 209, wherein said nucleic acid or nucleic acids comprise DNA, RNA or a mixture of RNA and DNA.

212. The process of claim 208, further comprising the step (b') of hybridizing said nucleic acid or nucleic acids of interest to complementary nucleic acid strands or sequences fixed or immobilized to a solid support.

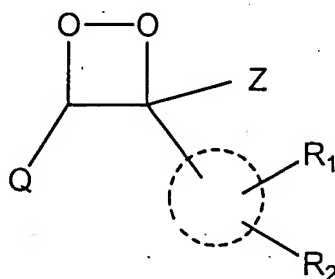
213. The process of 212, wherein said solid support comprises beads, tubes, microtiter plates, glass slides, plastic slides, microchip arrays, well or depressions.

214. The process of claim 208, wherein said measuring step (d) is carried out after or during a primer binding step, a primer extension step, a denaturation step or a step that is added for the purpose of fluorescence measurement

215. The process of claim 208, wherein said any of said process steps are carried out in a closed container.

216. The process of claim 215, wherein said closed container system comprises an illumination source and a detection device or unit.

217. A chemiluminescent reagent having the structure:



wherein Q comprises a cycloalkyl or polycycloalkyl group attached covalently to the 4-membered ring portion of said dioxetane above directly or indirectly through a linkage group; wherein Z comprises hydrogen, alkyl, aryl, aralkyl, alkaryl, heteroalkyl, heteroaryl, cycloalkyl or cycloheteroalkyl; and wherein R₁ and R₂ comprise chemical moieties attached to different sites of a cyclic ring attached to said dioxetane, and wherein R₁ is enzymatically converted into R₁* which comprises a chemical reactive group G₁, and wherein R₂ is attached to said cyclic ring through an oxygen atom and comprises a chemical reactive group G₂ which reacts with said G₁ to convert said dioxetane to an unstable light-emitting dioxetane form.

218. The chemiluminescent reagent of claim 217, wherein said Q comprises an adamantyl group.

219. The chemiluminescent reagent of claim 217, wherein said cyclic ring comprises an aromatic ring.

220. The chemiluminescent reagent of claim 217, wherein R_2 comprises a substituted or unsubstituted aliphatic group or an unsubstituted aromatic group.

221. The chemiluminescent reagent of claim 220, wherein said substituted aliphatic group comprises halogen, nitrates, sulfonates or nitrites.

222. The chemiluminescent reagent of claim 217, wherein enzymatically convertible R_1 comprises amides, esters, phosphates, carboxylic acids, fatty acids, glucose, xylose, fucose, or amino acids.

223. The chemiluminescent reagent of claim 217, wherein R_1 is enzymatically converted into R_1^* through the action of enzymes comprising amidases, esterases, acetylcholinesterases, acid phosphatases, alkaline phosphatases, decarboxylases, lipases, glucosidases, xylosidases, fucosidases, trypsin or chymotrypsin.

224. The chemiluminescent reagent of claim 217, wherein after said enzymatic conversion of R_1 to R_1^* and before said conversion of said dioxetane to the unstable light-emitting dioxetane form, an intermediate five- or six-membered ring is formed comprising a linkage between said G_1 and G_2 .

225. A process for detecting the presence or quantity of enzymatic activity of interest in a sample, said process comprising the steps of:

- (a) providing:
 - (i) said sample suspected of containing enzymatic activity;
 - (ii) the chemiluminescent reagent of claim 217;
 - (ii) reagents and buffers for carrying out chemiluminescent reactions;
- (b) forming a mixture of:
 - (1) (i), (ii) and (iii); or
 - (2) (ii) and (iii) and contacting said mixture of (ii) and (iii) with (i);
- (c) enzymatically converting the chemiluminescent reagent of claim 217 (ii) into an unstable light-emitting dioxetane form; and
- (d) measuring the quantity of light generated by said enzymatic conversion in step (c).

226. The process of claim 225, wherein in said providing step (a) Q in said chemiluminescent reagent (ii) comprises an adamantyl group.

227. The process of claim 225, wherein in said providing step (a) R₂ in said chemiluminescent reagent (ii) comprises a substituted or unsubstituted aliphatic group or an unsubstituted aromatic group.

228. The process of claim 227, wherein said substituted aliphatic group comprises halogen, nitrates, sulfonates or nitrites.

229. The process of claim 225, wherein said enzymatic converting step (c) is carried out by a substrate comprising amides, esters, phosphates, carboxylic acids, fatty acids, glucose, xylose, fucose, or amino acids.

230. The process of claim 225, wherein said enzymatic activity of interest comprises an amidase, an esterase, an acetylcholinesterase, an acid phosphatase, an alkaline phosphatase, a decarboxylase, a lipase, a glucosidase, a xylosidase, a fucosidase, a trypsin or a chymotrypsin.

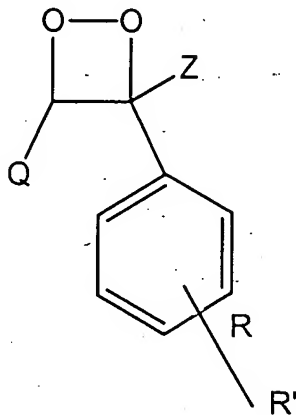
231. The process of claim 225, further comprising the step of forming an intermediate five- or six-membered ring comprising a linkage between said G_1 and G_2 in said chemiluminescent reagent (ii).

232. The process of claim 225, wherein any of said steps (a) through (d) are carried out in liquid phase or mixed phase.

233. The process of claim 225, wherein said enzymatic activity of interest is dependent upon the presence or quantity of another compound.

234. The process of claim 233, wherein said another compound comprises an RNA or DNA probe.

235. A chemiluminescent reagent having the structure:



wherein Q comprises a cycloalkyl or polycycloalkyl group attached covalently to the 4-membered ring portion of said dioxetane above directly or indirectly through a linkage group; wherein Z comprises hydrogen, alkyl, aryl, aralkyl, alkaryl, heteroalkyl, heteroaryl, cycloalkyl or cycloheteroalkyl; and wherein R comprises a chemical linker having a reactive site attached to the aromatic ring in said structure; and wherein R' comprises a substrate for an non-cleaving enzymatic process, wherein the product of said enzymatic process leads to further chemical rearrangements that generate an unstable light emitting dioxetane form.

236. The chemiluminescent reagent of claim 235, wherein said non-cleaving enzymatic process comprises oxidation or reduction.

237. The chemiluminescent reagent of claim 235, wherein said Q comprises an adamantyl group.

238. The chemiluminescent reagent of claim 235, wherein R comprises a substituted or unsubstituted aliphatic group or an unsubstituted aromatic group.

239. The chemiluminescent reagent of claim 238, wherein said substituted aliphatic group comprises halogen, nitrate, sulfonate or nitrite.

240. The chemiluminescent reagent of claim 235, wherein said reactive site comprises an oxygen, a nitrogen or a sulfur atom.

241. The chemiluminescent reagent of claim 235, wherein said enzymatic process is carried out by an enzyme comprising an oxidase or reductase.

242. The chemiluminescent reagent of claim 235, wherein after said enzymatic process, said dioxetane is converted to an unstable light-emitting dioxetane form.

243. A process for detecting the presence or quantity of enzymatic activity of interest in a sample, said process comprising the steps of:

- (a) providing:
 - (i) said sample suspected of containing enzymatic activity;
 - (ii) the chemiluminescent reagent of claim 235;
 - (ii) reagents and buffers for carrying out chemiluminescent reactions;
- (b) forming a mixture of:
 - (1) (i), (ii) and (iii); or
 - (2) (ii) and (iii) and contacting said mixture of (ii) and (iii) with (i);
- (c) enzymatically converting the chemiluminescent reagent of claim 344 (ii) into an unstable light-emitting dioxetane form; and
- (d) measuring the quantity of light generated by said enzymatic conversion in step (c).

244. The process of claim 243, wherein in said providing step (a) Q in said chemiluminescent reagent (ii) comprises an adamantyl group.

245. The process of claim 243, wherein in said providing step (a) R in the chemiluminescent reagent (ii) comprises a substituted or unsubstituted aliphatic group or an unsubstituted aromatic group.

246. The process of claim 245, wherein said substituted aliphatic group comprises halogen, nitrate, sulfonate or nitrite.

247. The process of claim 243, wherein said providing step (a) R in the chemiluminescent reagent (ii) comprises a reactive site comprising an oxygen, a nitrogen or a sulfur atom.

248. The process of claim 243, wherein said step of enzymatically converting (c) is carried out by an enzyme comprising an oxidase or reductase.

249. The process of claim 243, wherein any of said steps (a) through (d) are carried out in liquid phase or mixed phase.

250. The process of claim 243, wherein said enzymatic activity of interest is dependent upon the presence or quantity of another compound.

251. The process of claim 250, wherein said another compound comprises an RNA or DNA probe.

252. A dye composition of the formula

R – Fluorescent Dye

wherein R is covalently linked to said Fluorescent Dye comprises two or more members in combination from

- a) unsaturated aliphatic groups;
- b) unsaturated heterocyclic groups;
- c) aromatic groups;

and wherein R is capable of providing a conjugated system or an electron delocalized system with said fluorescent dye.

253. The dye composition of claim 252, wherein said unsaturated aliphatic groups comprise an alkene or an alkyne.

254. The dye composition of claim 252, wherein said aromatic groups comprise a phenyl group, an aryl group or an aromatic heterocyclic group.

255. The dye composition of claims 253 or 254, wherein said unsaturated aliphatic groups or aromatic groups are substituted.

256. The dye composition of claim 255, wherein said substituted unsaturated aliphatic groups or substituted aromatic groups comprise alkyl groups, aryl groups, alkoxy groups, phenoxy groups, amines, amino groups, amido groups, carboxy groups, nitrates, nitrites, sulfonates, sulfhydryl groups or phosphates.

257. The dye composition of claim 255, wherein said substituted aromatic groups comprise a fused ring structure.

258. The dye composition of claim 257, wherein said fused ring structure is a naphthalene, anthracene or a phenanthrene.

259. The dye composition of claim 252, wherein said combination comprises two members of the same group or of different groups.

260. The dye composition of claim 259, wherein said different groups comprise
an unsaturated aliphatic group (a) and an unsaturated heterocyclic group (b);
an unsaturated aliphatic group (a) and an aromatic group (c); or
an unsaturated heterocyclic group (b) and an aromatic group (c).

261. The dye composition of claim 252, wherein said fluorescent dye comprises an anthracene, a xanthene, a cyanine, a porphyrin, a coumarin or a composite dye.

262. The dye composition of claim 252, further comprising a charged or polar R' group.

263. The dye composition of claim 262, wherein said charged or polar R' group increases aqueous solubility of said composition.

264. The dye composition of claim 253 or 262, further comprising a reactive group R_x attached to either said fluorescent dye, said R group or said R' group.

265. The dye composition of claim 264, further comprising a linker arm attaching said reactive group R_x to said fluorescent dye, said R group or said R' group.

266. The dye composition of claim 264, wherein said reactive group R_x comprises
sulfhydryl, hydroxyl, amine, isothiocyanate, isocyanate, monochlorotriazine,
dichlorotriazine, mono- or di-halogen substituted pyridine, mono- or di-halogen
substituted diazine, maleimide, aziridine, sulfonylhalide, acid halide, hydroxysuccinimide
ester, hydroxysulfosuccinimide ester, imidoester, hydrazine, azidonitrophenyl, azide, 3-
(2-pyridyl dithio)-propionamide, glyoxal or aldehyde.

267. The dye composition of claim 265, wherein said reactive group R_x comprises sulfhydryl, hydroxyl, amine, isothiocyanate, isocyanate, monochlorotriazine, dichlorotriazine, mono- or di-halogen substituted pyridine, mono- or di-halogen substituted diazine, maleimide, aziridine, sulfonylhalide, acid halide, hydroxysuccinimide ester, hydroxysulfosuccinimide ester, imidoester, hydrazine, azidonitrophenyl, azide, 3-(2-pyridyl dithio)-propionamide, glyoxal or aldehyde.

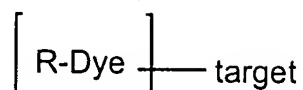
268. The dye composition of claim 264, wherein as a reactive group R is capable of forming a carbon-carbon linkage with a target.

269. The dye composition of claim 265, wherein as a reactive group R is capable of forming a carbon-carbon linkage with a target.

270. The dye composition of claim 268, wherein said reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

271. The dye composition of claim 269, wherein said reactive group R comprises an alkene group, an alkyne group, a halogenated compound or a metallo-organic compound.

272. A labeled target having the structure



wherein said Dye is a fluorescent dye, wherein R is covalently linked to said Dye, and wherein R comprises two or more members in combination from

- a) unsaturated aliphatic groups;
- b) unsaturated heterocyclic groups;
- c) aromatic groups;

and wherein R is capable of providing a conjugated system or an electron delocalized system with said Dye.

comprises two or more unsaturated aliphatic groups, unsaturated heterocyclic groups, aromatic groups, or combinations of the foregoing groups and wherein R is covalently attached to said fluorescent dye and is capable of providing a conjugated system or an electron delocalized system with said fluorescent dye, and wherein said target is covalently attached to said Dye or said R.

273. The labeled target of claim 272, wherein said unsaturated aliphatic groups comprise an alkene or an alkyne.

274. The labeled target of claim 272, wherein said aromatic groups comprise a phenyl group, an aryl group or an aromatic heterocyclic group.

275. The labeled target of claims 273 or 274, wherein said unsaturated aliphatic groups or aromatic groups are substituted.

276. The labeled target of claim 272, wherein said substituted unsaturated aliphatic groups or substituted aromatic groups comprise alkyl groups, aryl groups, alkoxy groups, phenoxy groups, amines, amino groups, amido groups, carboxy groups, nitrates, nitrites, sulfonates, sulfhydryl groups or phosphates.

277. The labeled target of claim 275, wherein said substituted aromatic groups comprise a fused ring structure.

278. The labeled target of claim 277, wherein said fused ring structure is a naphthalene, anthracene or a phenanthrene.

279. The labeled target of claim 272, wherein said combination comprises two members of the same group or of different groups.

280. The labeled target of claim 279, wherein said different groups comprise
an unsaturated aliphatic group (a) and an unsaturated heterocyclic group (b);
an unsaturated aliphatic group (a) and an aromatic group (c); or
an unsaturated heterocyclic group (b) and an aromatic group (c).

281. The labeled target of claim 272, wherein said fluorescent dye comprises an anthracene, a xanthene, a cyanine, a porphyrin, a coumarin or a composite dye.

282. The labeled target of claim 272, further comprising a charged or polar R' group

283. The labeled target of claim 272, wherein said charged or polar R' group increases aqueous solubility of said composition.

284. The labeled target of claim 282, further comprising a linker arm attaching said target to said fluorescent dye, said R group or said R' group.

285. The labeled target of claim 272, wherein said target comprises a protein, a peptide, a nucleic acid, a nucleotide or a nucleotide analog, a receptor, a natural or synthetic drug, a synthetic oligomer, a synthetic polymer, a hormone, a lymphokine, a cytokine, a toxin, a ligand, an antigen, a hapten, an antibody, a carbohydrate, a sugar or an oligo- or polysaccharide.

286. The labeled target of claim 285, wherein said ligand comprises biotin, iminobiotin, digoxigenin or fluorescein, and the dye comprises a fluorescent dye.

* * * * *